



Armed Forces College of Medicine AFCM



Descending pathways

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INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

- 1) Identify the origin, course, distribution, termination, function & effects of lesion of the cortico-spinal tract.**
- 2) Identify the origin, course, distribution, termination, function & effects of lesion of the cortico-nuclear tract.**
- 3) Differentiate between the pyramidal & extrapyramidal systems.**

Lecture Plan



1. Part 1 (5 min) Introduction to descending motor pathways
2. Part 2 (25 min) Corticospinal tracts
3. Part 3 (15min) Corticonuclear tract
4. Part 4 (10 min) Extrapyramidal tracts
5. Part 5 (5 min) Summary

Descending Pathways Of the spinal cord

Aim to control the activity of the somatic nervous system (spinal Ns. & cranial Ns.)

Descending pathways



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graph TD; A[Descending pathways] --> B[Pyramidal tracts]; A --> C[Extra-pyramidal tracts]; B --> D[To control spinal Ns]; B --> E[To control cranial Ns]; D --> F[Corticospinal tracts]; E --> G[Corticonuclear tracts = Corticobulbar tracts];
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The diagram is a hierarchical flowchart. At the top is a grey box labeled 'Descending pathways'. A line from this box branches into two boxes: a yellow box labeled 'Pyramidal tracts' on the left and a dark blue box labeled 'Extra-pyramidal tracts' on the right. From the 'Pyramidal tracts' box, a line branches into two boxes: a red box labeled 'To control spinal Ns' on the left and a green box labeled 'To control cranial Ns' on the right. From the 'To control spinal Ns' box, a line leads down to a red box labeled 'Corticospinal tracts'. From the 'To control cranial Ns' box, a line leads down to a green box labeled 'Corticonuclear tracts = Corticobulbar tracts'.

Pyramidal tracts

Extra-pyramidal tracts

To control spinal Ns

To control cranial Ns

Corticospinal tracts

**Corticonuclear tracts =
Corticobulbar tracts**

I. Pyramidal Tracts

A) Corticospinal Tract

Aim is to control spinal Ns.

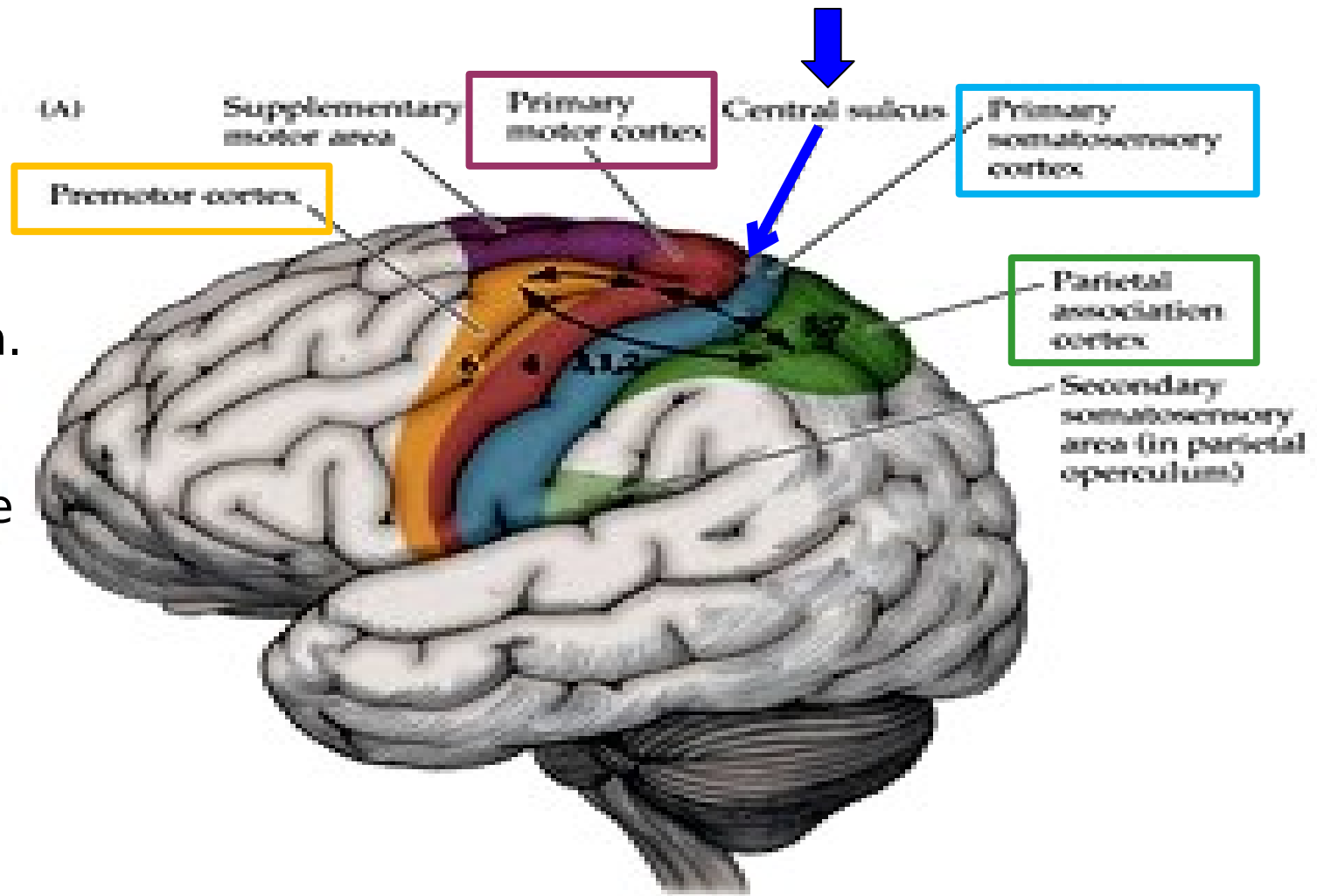
ORIGIN:

1- Upper 2/3 of the contralat. motor area (area 4) in the precentral gyrus where:

- a. Body is represented upside-down.
- b. Body is represented in movements, not in Ms.
- c. The highly skilled movements are widely represented.

2- Other areas:

- a. Area 6 (premotor area)
- b. Sensory areas (Sm I & II)?

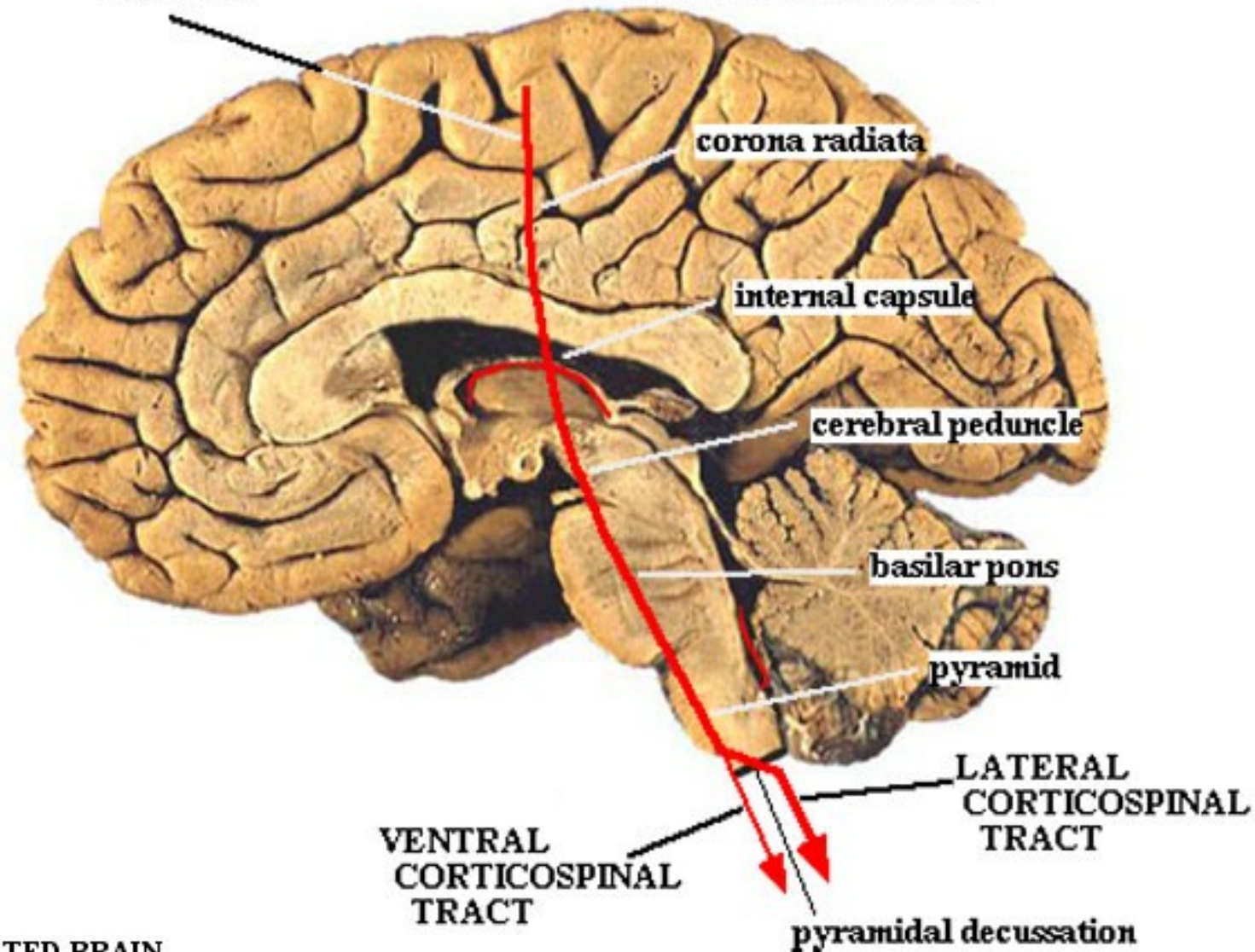


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THE CORTICOSPINAL TRACT

THE CORTICOSPINAL TRACT

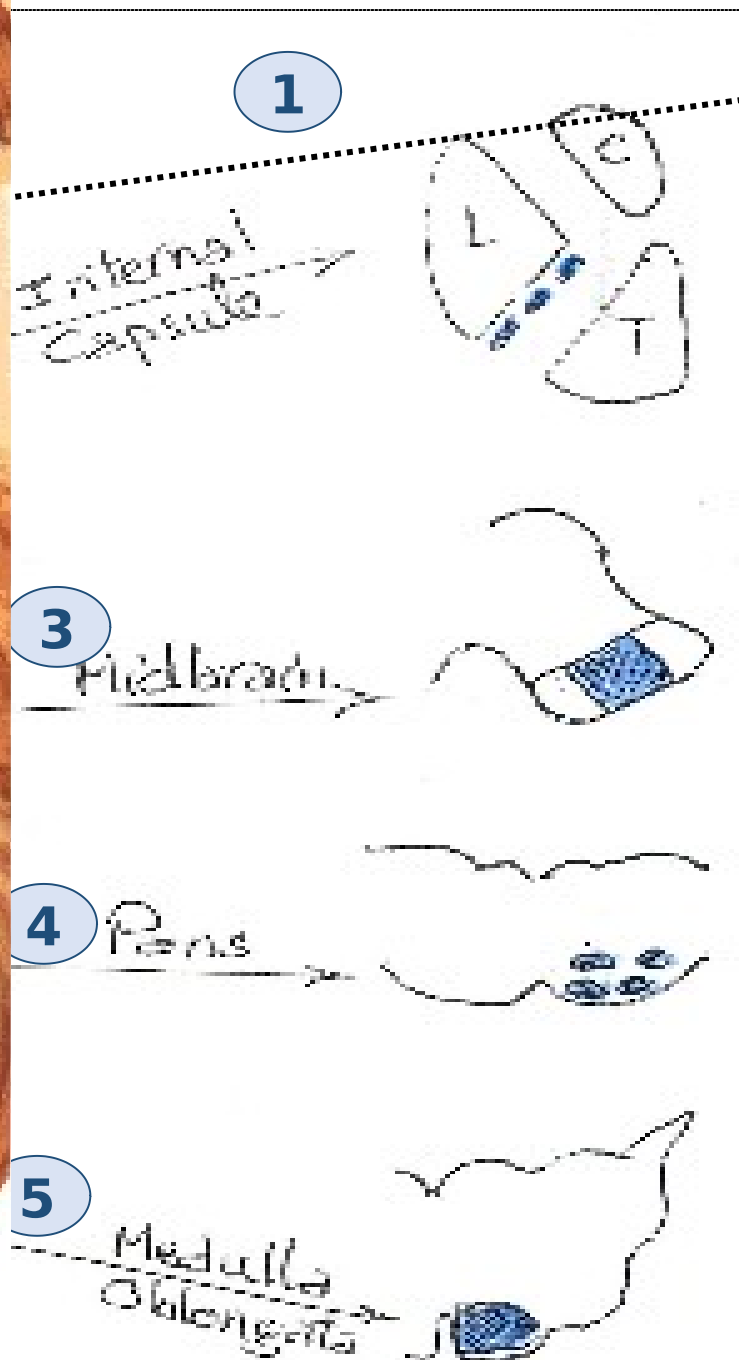
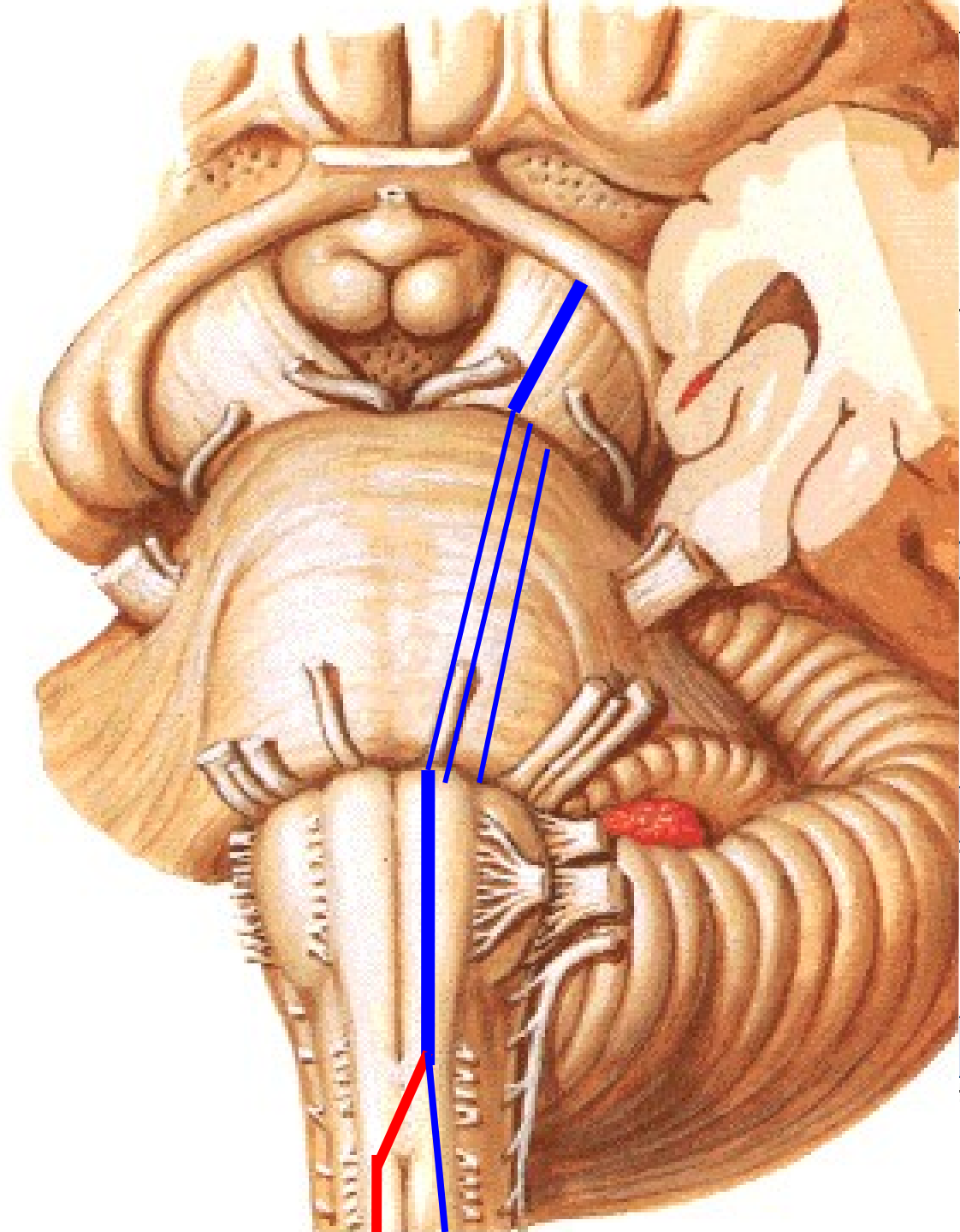
PASSES THROUGH:



COURSE:

- 1- Corona radiata
- 2- Ant. 2/3 of post. Limb of internal capsule
- 3- Middle 3/5 of crus cerebri (basis pedunculi) of **midbrain**
- 4- Form separate bundles in the basis pontis of the **pons**
- 5- In **medulla**, regroup into 1 bundle forming the pyramid

Prof. Dr. George F.B.



COURSE:

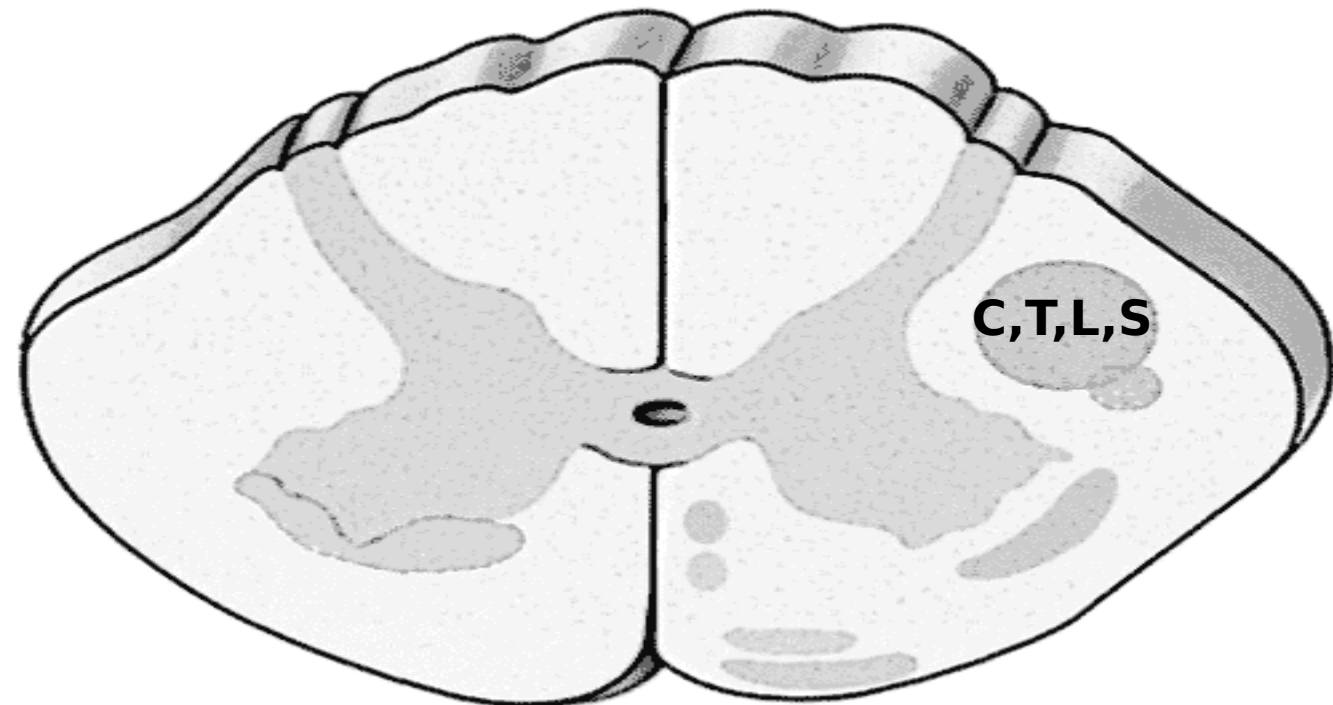
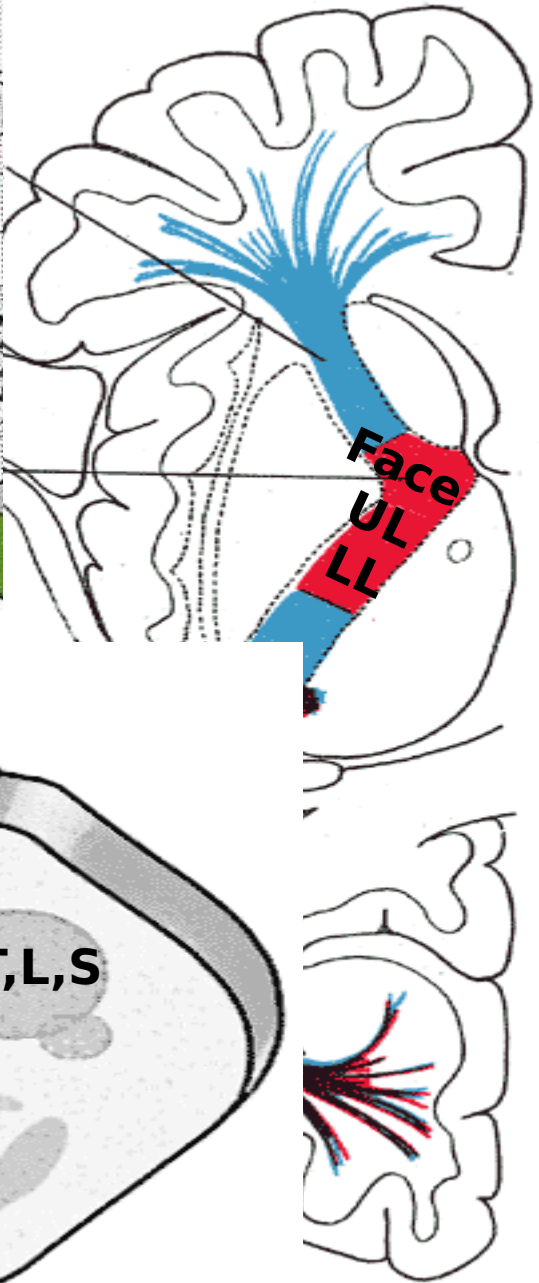
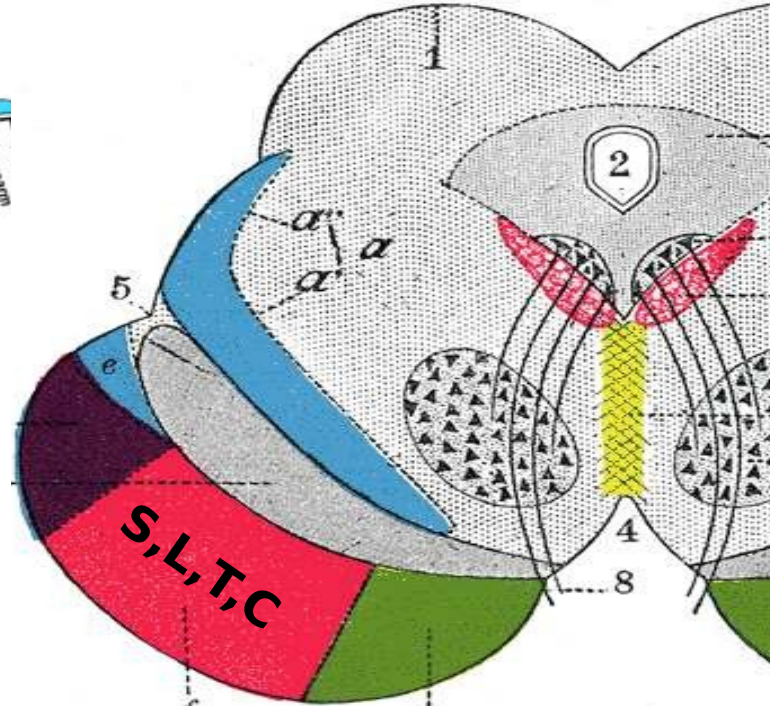
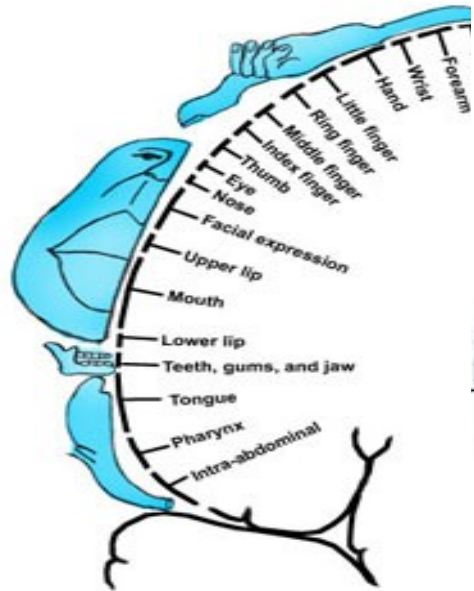
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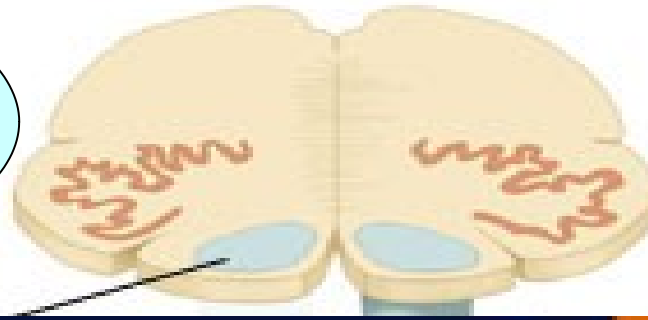
LAMINATION:

1- Cerebral cortex:
upside-down.

2- Internal capsule:
Face Ms. in genu; UL
most ant. + LL most
post. in post. limb

3- In midbrain
& spinal cord: C.
fibers are med. & S.
fibers are lat.).

6- In the lower part of medulla, **80-90% fibers decussate** & **10-20% descend ipsilaterally**



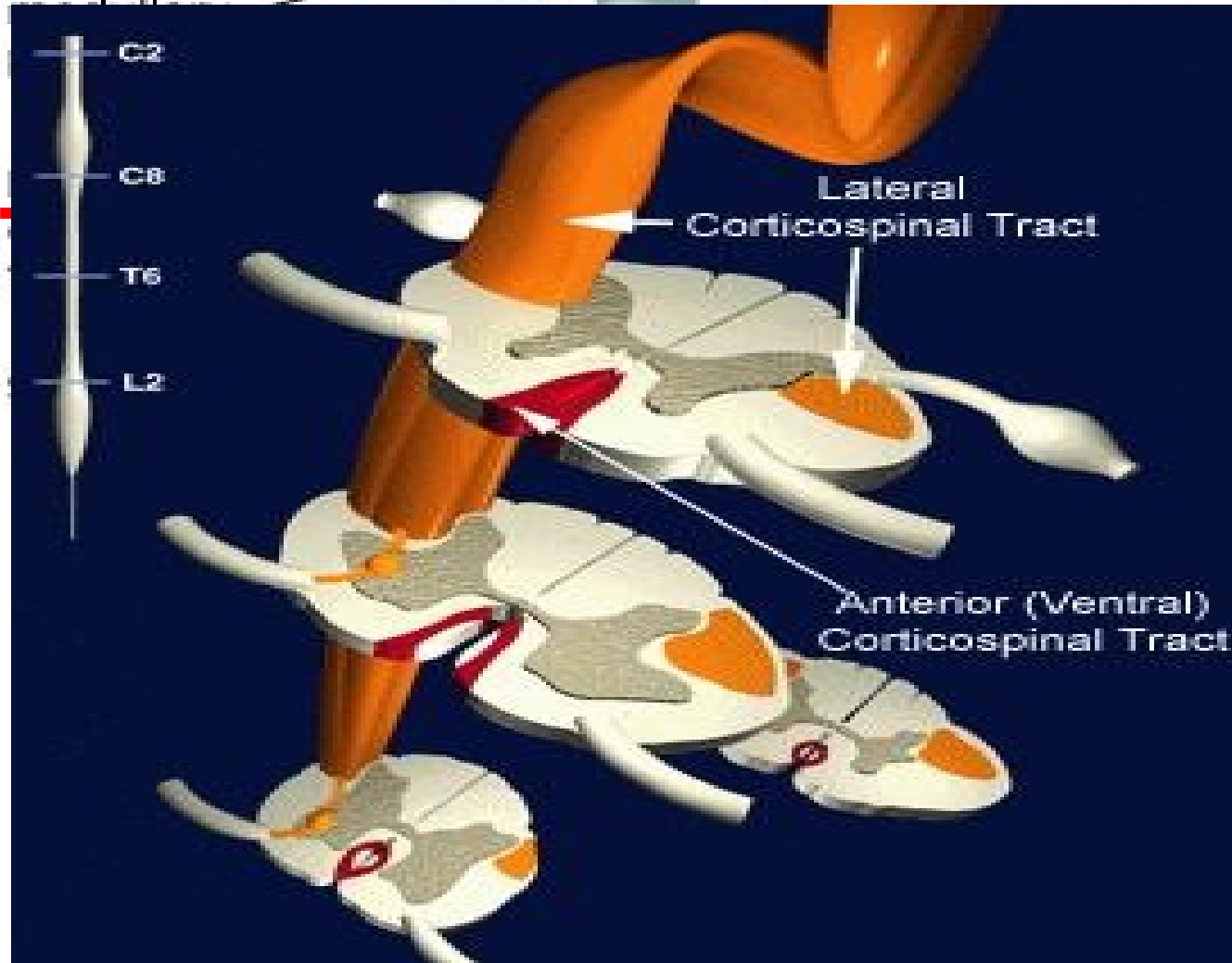
***= 80 - 90%**
of fibers

*** In the lat.**
column

*** Crossed**

*** In all**
Segments

*** End on lat.**
group of AHCs.,
i.e supply limbs



***= 10 - 20%**
of fibers

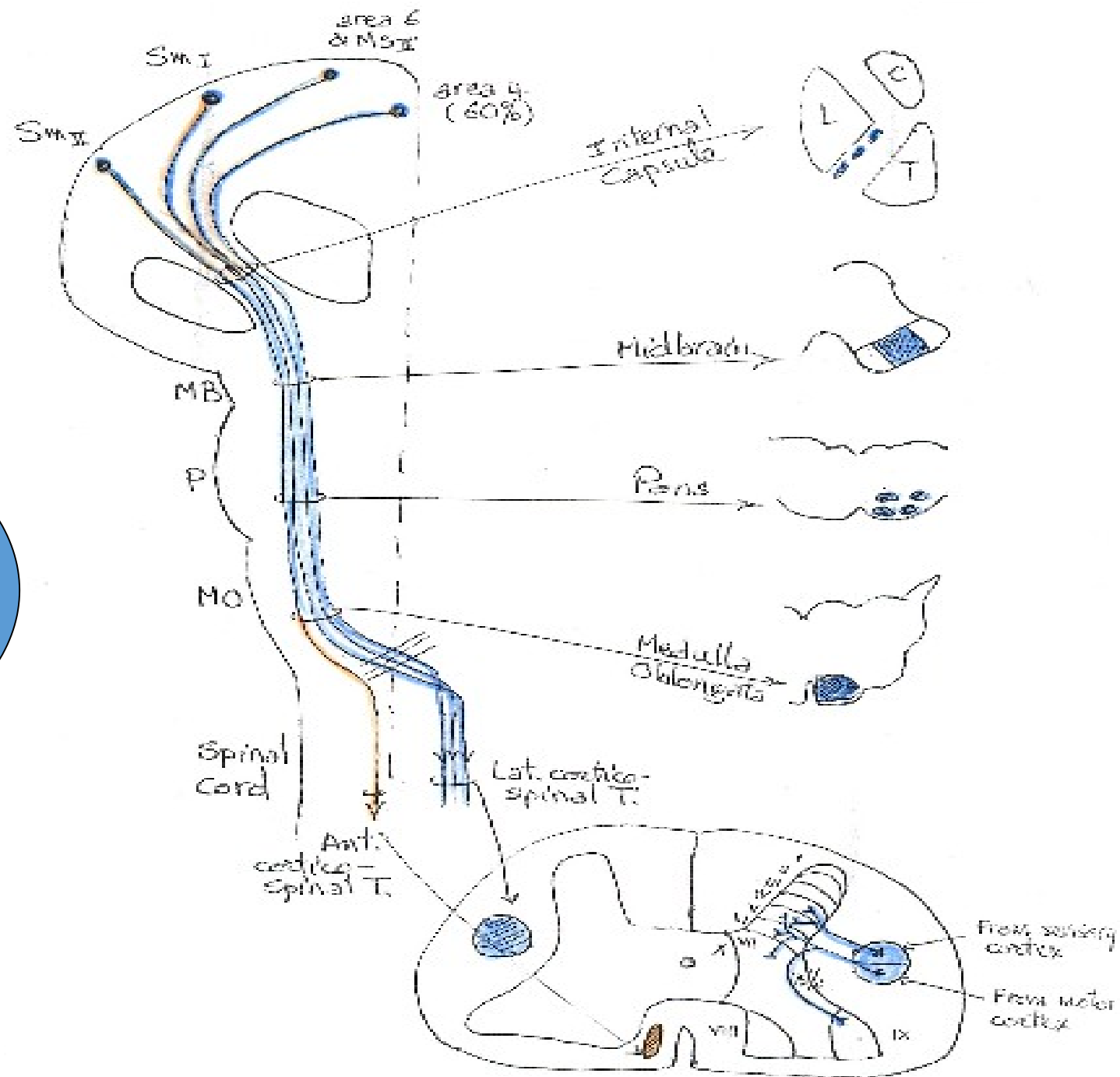
*** In the ant.**
column

*** Uncrossed,**
but they
will cross

***Till T6**
Segment

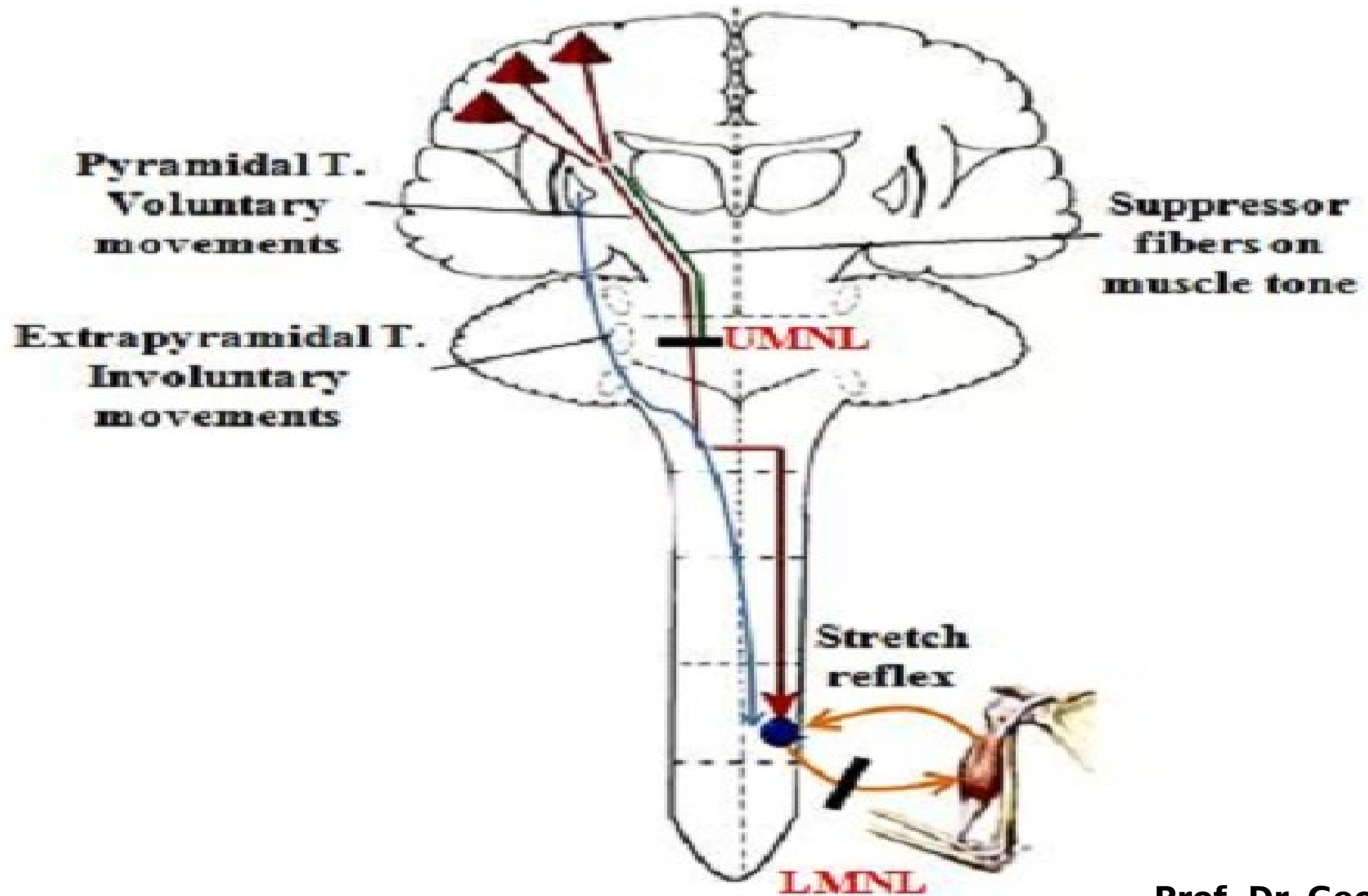
*** End on med.**
group of AHCs.,
i.e supply trunk

**Let's revise
the whole
pathway**



Function

- **Execution of voluntary discrete skillful movement of the contralateral side of the body.**
- **↓↓ M. tone & deep reflexes.**



UMNL (Upper Motor Neuron Lesion)	LMNL (Lower Motor Neuron Lesion)
Wide spread paralysis	Localized paralysis
Only voluntary movements are lost.	All movements are lost.
No atrophy except late.	Early atrophy.
Hyper-tonia (Clasp knife).	Hypo-tonia.
Hyper-reflexia.	Hypo-reflexia.
+ve Babiniski's sign.	-ve
+ve Clonus.	-ve

Normal toe flexion



Positive Babinski's reflex





The corticospinal tract descends:

- A. In the genu of internal capsule.**
- B. In the medial 3/5 of the crus cerebri (basis pedunculi).**
- C. Divided into separate bundles in the pons.**
- D. Lateral to the pyramid of the medulla.**
- E. Ipsilateral all through the spinal cord.**



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B) Corticonuclear tract

Aim is to control cranial Ns.

Motor area 4

Internal Capsule

MB

P

MO

SC

Midline



Internal capsule

MB

P

MO

4



Corticonuclear tract

@ Origin from **lower part of area 4 (face area)**.

@ **Genu of internal capsule.**

@ **Middle 3/5 of crus cerebri.**

@ Terminates bilaterally on the **motor cranial N. nuclei** (**except lower 1/2 of VII & XII which receive only from the contralat. side**)

Lecture Quiz



Cortico-nuclear fibers pass in which of the following parts of the internal capsule?

- a) Anterior limb.
- b) Posterior limb.
- c) Genu
- d) Sublentiform part
- e) Retrolentiform



Cortico-nuclear fibers pass in which of the following parts of the internal capsule?

- a) Anterior limb.
- b) Posterior limb.
- c) Genu**
- d) Sublentiform part
- e) Retrolentiform

Relax, if you can



II. Extra-pyramidal Tracts

	Pyramidal system	Extra-pyramidal system
<i>Origin</i>	Localized (areas 4, 6, 8)	Widely distributed (cortical & subcortical areas)
<i>In medulla</i>	It occupies the pyramid	It is scattered in different areas, but not in pyramid
<i>Crossing</i>	All fibers cross, the majority of which cross in pyramidal (motor) decussation in the lower medulla.	Some tracts are uncrossed, while others are crossed (at the level of their origin)
<i>No. of neurons</i>	1 from cerebral cortex to AHCs. (<u>Jet tract</u>) توربینی	Many (with many synapses) from cerebral cortex to AHCs (<u>Many stops</u>) قشاش
<i>Developed</i>	After the extra-pyramidal tracts	Before the pyramidal tract
<i>Function</i>	1- ↓ ↓ M. tone & deep reflexes 2- Fine, isolated, precise, skillful movements e.g. typing, writing, playing piano.	1- Some ↑ ↑, others ↓ ↓ 2- Gross, synergic, semi-automatic movements e.g. equilibrium, swinging arms. 3- Set the background for subsequent activity of pyramidal tract.

Thank You